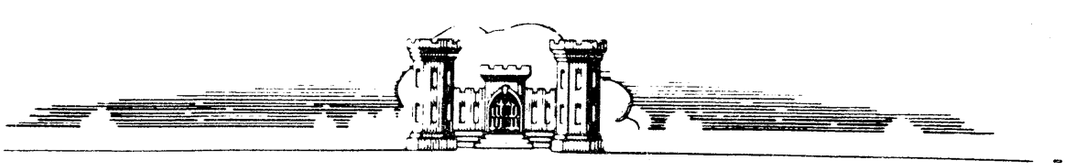
JOSIAS RIVER
OGUNQUIT
MAINE

SURVEY
(REVIEW OF REPORTS)



CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION, BOSTON, MASS.

JUNE 8, 1951

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NOT FOR PUBLIC RELEASE

SURVEY
(REVIEW OF REPORTS)

OF

JOSIAS RIVER, OGUNQUIT, MAINE

SYLLABUS

The Division Engineer finds that prospective benefits are sufficient to warrant the improvement of Josias River, Ogunquit, Maine. He recommends modification of the existing project to include the construction of a breakwater extending 350 feet in a southeasterly direction from the southeast side of Adams Island to the ledge pinnacles on the north side of Perkins Cove. The breakwater is designed for a top width of 10 feet at an elevation of 15 feet above mean low water, with side slopes of 1 on 1.5. The construction is estimated to cost $55,000, with $500 annually for maintenance, exclusive of aids to navigation. He further finds that the prospective benefits are insufficient to warrant the extension of the anchorage basin at this time.

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CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
BOSTON, MASS.

June 8, 1953

SUBJECT: Survey (Review of Reports) on Josias River, Ogunquit, Maine.

TO: The Chief of Engineers, Department of the Army, Washington, D. C.

AUTHORITY

1. This report is submitted in compliance with the following resolution, adopted February 17, 1949, by the Committee on Public Works of the House of Representatives:

"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES, That the Board of Engineers for River and Harbors be, and is hereby, requested to review the reports on Ogunquit Perkins Cove, Maine, contained in House Document Numbered 227, Seventy-sixth Congress, First Session, with a view to determining if it is advisable to modify the existing project in any way, and particularly with a view to the construction of a breakwater."

2. A report of survey scope was authorized by the Chief of Engineers on March 23, 1949.

REPORT UNDER REVIEW

3. The report under review, published in House Document No. 227, Seventy-sixth Congress, First Session, is a favorable survey report submitted by the Secretary of War, March 15, 1939. The report recommended the improvement of Ogunquit-Perkins Cove, Maine, by providing an anchorage basin about 3.2 acres in area, having a depth of 5 feet at mean low water in Flat Pond, and a connecting channel, 40 feet wide and 5 feet deep, through Josias River to Perkins Cove. This report is the basis of the existing project.

4. The report under review is designated as, "Survey of Ogunquit-Perkins Cove, Maine". The authorities for this report and the present review also refer to the locality under study by that name. The River

and Harbor Act of March 2, 1945 which authorized the existing project, designates the locality as, "Josias River, Maine". For purposes of conformity with the name of the existing project, this review of reports designates the locality as "Josias River, Ogunquit, Maine".

DESCRIPTION

5. Perkins Cove is a small indentation in the generally rocky Maine coast about 1 mile south of the center of Ogunquit and about 30 miles southwest of Portland, Maine. It measures about 350 feet in a north and south direction and about 430 feet in an east and west direction. Depths in the cove range from 25 feet at its outer entrance to 5 feet at the head of the cove where the mouth of the Josias River is situated. The Josias River formerly flowed into Oarweed Cove, a small cove north of and adjacent to Perkins Cove. About 50 years ago local interests dug a channel from Perkins Cove, where the local fleet was then based, into the Josias River and closed the channel into Oarweed Cove. This was done to enable the boat owners to bring their boats up the river more easily in times of storms and heavy wave action. The Josias River is now being dredged under the Federal project to a depth of 5 feet from its entrance into Flat Pond, approximately 800 feet up the river. An anchorage basin covering an area of about 3 acres is also being dredged to a 5-foot project depth in this pond. For about 300 feet above the basin, the Josias River flows across a small tidal marsh. The elevation of the marsh is about mean high water. The tidal portion of the river terminates at a small falls and rapids, which is located at the inner end of the marsh. The mean range of tide is 8.7 feet, the spring range 10.0 feet. The location is shown on the United States Coast and Geodetic Chart numbered 1205 and on the map accompanying this report.

TRIBUTARY AREA

6. The area contiguous to Perkins Cove and Josias River is occupied by the Ogunquit Village Corporation. The Corporation is a self-

governing section of the town of Wells, established as such by a special act of the Maine Legislature in March 1913. There is no record of the permanent population of the village, but, local authorities have advised that there are between 600 and 700 permanent residents. The real estate valuation of the Corporation in 1950 was 47 percent of the valuation of the town of Wells, which was estimated at about $4,000,000. There are no important industries in the village, the principal occupations of the permanent residents being those associated with the summer recreational business and the fishing industry. Numerous small farms are also scattered throughout the area. There are no railroad connections to the village, the nearest being 6 miles distant. The area is served by various motor truck common carriers over U. S. Highway Route No. 1 which passes through the town.

BRIDGES

7. There is one bridge over the Josias River in the area considered in this report. It is a wooden foot-bridge, owned by the Ogunquit Village Corporation and located about 550 feet above the mouth of the river. It has a hand operated draw span with a horizontal clearance of 43 feet and, when closed, a vertical clearance of 24 feet. The bridge was altered in 1942, when the draw span was added to an existing fixed bridge. No Federal permit has been issued for the construction of a bridge in this location.

PRIOR REPORTS

8. Pertinent report data regarding improvements of this locality are listed in the following tabulation:

Published In	Nature and Date of Report	Work Considered and Recommendation
House Document No. 419, 62nd Congress, 2nd Session	Preliminary Examination 1911	Construction of a breakwater and some dredging.-Unfavorable
Not Published	Preliminary Examination 1930	Dredging of channel 40 feet wide and 3 feet deep at mean low water from Perkins Cove to Flat Pond.-Unfavorable.
House Document No. 227, 76th Congress, 1st Session	Preliminary Examination and Survey 1935 and 1938	Dredging of an anchorage basin about 3 acres in area and 5 feet deep at low water in Flat Pond, and a connecting channel 5 feet deep at mean low water and 40 feet wide through Josias River to Perkins Cove.-Favorable

EXISTING CORPS OF ENGINEERS PROJECT

9. The existing project for the improvement of Josias River, Ogunquit, Maine was authorized by the River and Harbor Act of March 2, 1945 and comprises the project recommended in the reports published as House Document 227, 76th Congress, 1st Session. The existing project provides for a channel 5 feet deep and 40 feet wide in the Josias River from that depth in Perkins Cove to and including an anchorage basin in Flat Pond of the same depth and about 3.2 acres in area. The dredging of the channel and basin is presently in progress with completion of the work scheduled for June 1951. On March 31, 1951 the cost to the United States for new work under the existing project was $14,070.83. There have been no maintenance costs to date.

LOCAL COOPERATION ON EXISTING PROJECT

10. The requirements for local cooperation are contained in House Document No. 227, 76th Congress, 1st Session. These requirements were modified by the River and Harbor Act of March 2, 1945. Conditions of local cooperation set forth in the House Document state that;

> "local interests furnish free of cost to the United States all land, easments, and rights-of way, and spoil-dispoal areas for the initial work and for subsequent maintenance as required; hold and save the United States free from claims for damages resulting from the improvements; make alteration to the existing footbridge across Josias River as may be required by the Secretary of War; provide suitable landing facilities open to all on equal terms; and contribute one half of the initial cost of the improvement, but not to exceed $32,000."

The River and Harbor Act adopted the project in accordance with the House Document,

> "except that the useful work done on the project by local interests shall be accepted toward the fulfillment of the requirement of local cooperation."

11. The provisions of the House Document were modified by the River and Harbor Act to allow local interests to receive credit for work accomplished toward the project subsequent to the preparation of the reports contained in the document. Prior to the adoption of the project by Congress, the Ogunquit Village Corporation spent $35,000.00 toward the accomplishment of the project substantially in accordance with Government plans. The village also altered the bridge by addition of a draw span. Assurances that the conditons of local cooperation would be met were received from the Ogunquit Village Corporation and approved by the Chief of Engineers on August 25, 1949. The requirements of local cooperation have been fully complied with.

TERMINAL FACILITIES

12. There are four wharves in the harbor, all owned by the Ogunquit Village Corporation and open to the public free of charge. Three of these wharves are located in Flat Pond and one in Josias River between Flat Pond and Perkins Cove. The Village Corporation has also erected a pile and timber bulkhead backed with earth fill, on the northerly shore of the river. The easterly end of this bulkhead is about 300 feet below the footbridge from which point it extends

about 490 feet along the northerly bank of the river into Flat Pond. A marine railway capable of handling boats up to 50 feet in length is located immediately east of the bulkhead.

13. One of the town wharves is located just below the footbridge. It consists of a float, 20 feet long by 8 feet wide, connected to the bulkhead by means of a movable ramp. The next wharf upstream, located about 100' above the bridge, is a 30-foot long by 8-foot wide platform projecting from the bulkhead. Three landing floats, 8 feet wide by 30 feet long, are placed in tandem just above this wharf and a 1-ton electric hoist is located on the wharf itself. In Flat Pond, about 300 feet above the bridge on the northerly shore, there is an open pile and timber wharf 10 feet wide and 30 feet long. Facilities for servicing boats with fuel and water have been placed on this wharf. About 40 feet above this latter wharf there is another pile and timber wharf. This wharf is about 8 feet wide and 20 feet long. It has no mechanical handling facilities and its dock is dry at mean low water.

IMPROVEMENT DESIRED

14. A public hearing, held at Ogunquit Village on August 28, 1950, was attended by numerous interested persons, including officials of State and local governments, the Perkins Cove Harbor Committee, fishermen, and summer residents. The hearing was held in order to ascertain the views of local interests as to the extent and necessity of improvements in the harbor.

15. Proponents of the improvement requested modifications of the existing project; the first being the construction of a breakwater, to be located on the northerly side of Perkins Cove, extending 350 feet in a southeasterly direction from the southeast side of Adams island to the ledge pinnacles on the north side of Perkins Cove, the second, being the dredging of the marsh area at the westerly end of the basin to a depth of 5 feet.

16. The breakwater was requested primarily to lessen the effects of northeasterly and easterly storms. It was claimed that entrance to the river is impossible during these storms and for 2 to 3 days afterward. This is caused by heavy seas which break over the ledge pinnacles on the north side of the cove creating a turbulence at the entrance. It was also claimed that the heavy seas create a surge, which runs up the river and into the basin, causing considerable damage to anchored boats and shore installations. It is also believed locally that the breakwater would prevent shoaling of the channel and provide more protected anchorage space in the cove.

17. The extension of the anchorage basin was requested in order to ease the present crowded anchorage conditions in the basin. This would allow accommodation of a greater number of boats.

COMMERCE

18. The following table gives a comparative statement of commerce for the years 1945,to 1949, and freight traffic for 1949 in detail.

COMMERCE SINCE 1945

YEAR	TONS	PASSENGERS
1945	350	None reported
1946	375	5,400
1947	340	10,000
1948	145	8,922
1949	121	None reported

FREIGHT TRAFFIC, 1949

DOMESTIC

LOCAL

Fish, fresh or frozen, except shellfish	69 tons
Shellfish, and shellfish products	52 tons
TOTAL	121 tons
GRAND TOTAL, ALL TRAFFIC	121 tons

The above statistics indicate a decrease in tonnage of fish landings of 57 percent in 1948 over 1947, and a decrease of 65 percent in 1949 over 1947. Local interests, upon being advised of these records, have stated that they believe these statistics are incomplete since 1948 and 1949 were two of their biggest years in fish landings and passenger

traffic. They attributed the reported decreases for these years as due to a general laxity in reporting landings on the part of the fishermen and charter-boat operators. In support of this they stated that, while the statistics report no passengers in 1949 it actually was one of their greatest years for charter boating which is the only source of passenger traffic in the harbor.

VESSEL TRAFFIC

19. The number and size of vessels using Josias River are indicated in the following statement of traffic covering the years 1945 to 1949, the period for which such statistics are available.

TRIPS INBOUND AND OUTBOUND

Draft In Ft.	1945	1946	1947	1948	1949
2-6	755	6000*	5300	4000	4400

*Estimated

20. The fleet now based in the cove comprises the following vessels:

TYPE	LENGTH IN FT.	DRAFT IN FT.	NUMBER
Fishermen	22 to 50	2 to 4.5	22
Charter Boats	34 to 45	5	3
Recreational Craft	18 to 34	2 to 4.5	15
		TOTAL	40

DIFFICULTIES ATTENDING NAVIGATION

21. Perkins Cove, the entrance to Josias River, is entirely exposed to winds originating from northeasterly through southeasterly directions. Storms from the northeast are of the highest velocity occuring in the locality. These storms produce heavy seas which break over the ledge pinnacles on the northerly side of the cove, creating a turbulence at the entrance to the Josias River. Navigation of the cove and entrance is impossible during storm periods and extremely hazardous from 24 to 48 hours after the storm has abated due to the heavy swells that usually persist after these storms. Storms from southeasterly directions are usually of shorter duration, less

frequency, and lower wind velocity, resulting in lighter seas and smaller swells.

22. During the period of heavy seas and swells a surge is created at the entrance which continues into the river and basin making the mooring and landing of boats very difficult. The height of this surge was estimated locally at from 2 to 4 feet at the bridge, decreasing to about 1 foot at the westerly end of the basin.

WATER POWER AND OTHER SPECIAL SUBJECTS

23. The waterway is tidal. Matters of water power or flood control are not pertinent to this report. The proposed improvement would have no adverse effect on shellfish or wildlife.

PLAN OF IMPROVEMENT

24. The plan of improvement considered herein meets the desire of local interests. The plan is based on the hydrographic and probing survey of December 1945 to January 1946, and the hydrographic survey of December 1950. The plan would provide for the construction of a breakwater at the entrance to the Josias River and the extension of the authorized 5-foot anchorage basin. The breakwater would be a stone structure constructed on the ledge ridge which extends southeasterly from the southeast side of Adams Island to the ledge pinnacles on the north side of the cove. The breakwater would have a length of 350 feet, a top width of 10 feet at an elevation of 15 feet above mean low water, and side slopes of 1 on 1.5. The additional anchorage area would extend westerly at the same 5-foot depth as the existing project.

25. The location of the breakwater is that proposed by local interests. The top elevation of 15 feet was adopted after a design analysis of similar breakwaters which have proved satisfactory in Maine. The top would be 6.3 feet above mean high water and about 5.0 feet above the highest tides predicted in the vicinity of Ogunquit. It is considered that this height would prove adequate in protecting the entrance to Josias River.

26. The area of the additional anchorage was adopted after consultation with local interests. It would provide 1.1 acres of additional mooring. The area comprises the remainder of the marsh which was partially removed in constructing the existing basin.

AIDS TO NAVIGATION

27. The United States Coast Guard has been consulted on the matter of aids to navigation and has advised that one daybeacon on the breakwater, one lighted bell buoy, and 2 reflector installations on the existing buoys would be required. The estimated cost of the installations amounts to $8,400.00 with $700.00 for annual maintenance.

SHORE LINE CHANGES

28. The Josias River reaches the ocean at a small indentation in a generally bare ledge coastline. Within this indentation are two ledge outcroppings. A narrow barrier beach extends southeasterly from the northerly shore of the mainland to the inner end of the smaller outcrop and thence to the larger and most southerly of the two outcrops. This beach and the large ledge outcrop divides the indentation into two coves, Perkins Cove on the south and Oarweed Cove on the north. Josias River flows in back of the barrier beach and into Perkins Cove. The barrier has been increased in width through the disposition of materials dredged from Josias River and its seaward face in Oarweed Cove is divided into two pockets by the two ledges which extend perpendicularly from the shore. The shore of Perkins Cove is bare ledge. Between Ogunquit Beach, about one mile north of Perkins Cove, and York Beach about 5 miles to the south, there are a few small, narrow pocket beaches between the ledge outcroppings but there are no extensive sandy beaches.

29. The location of the proposed breakwater is the crest of a ledge ridge which extends southeasterly from the north side of Perkins Cove and is exposed at low water. Increasing the height of this ridge will not affect the ledge shore of Perkins Cove or have any effect

upon the shoreline north and south of the cove. The lack of extensive beaches in the immediate vicinity does not indicate that any appreciable amount of material is drifting along the shore. Since the dominant winds which act upon the shore are from the north and northeast, the dominant direction of littoral drift is north to south and material would probably be deposited in Oarweed Cove before reaching the proposed breakwater location. The configuration of Oarweed Cove is such that material moving from the north may be expected to be retained between the ledges which act as natural groins. Therefore, it is not considered that the proposed breakwater would trap any appreciable amount of material or build out the immediate shore.

30. The proposed extension of the anchorage basin would remove the remaining marsh to a depth of 5 feet. It is not considered that this relatively shallow depth will be sufficient to have any effect upon the developed shoreline except for minor changes which may occur immediately after the dredging is accomplished.

ESTIMATES OF FIRST COST

31. Quantities estimated for dredging are for materials in place with an allowance for 1 foot of overdepth. The unit price for dredging is based on the materials being removed by dipper dredge and disposed at sea. The unit price is also based on the nature and small amount of material involved. Current dredging in the harbor and probings from recent surveys have indicated the presence of large boulders or ledge in the area involved in the basin extension, and an estimate of the quantity of such material has been made. Quantities for breakwater construction include allowance for voids and tolerances. Unit prices include allowances for engineering, contingencies, inspection, and overhead, and are based on April 1951 cost indices. The cost of aids to navigation were furnished by the U. S. Coast Guard. The estimates of first costs are as follows:

a. CONSTRUCTION

(1) Extending Anchorage Basin

Dredging 5 ft. deep at mean low water approximately 1.1 acres in extent, 32,000 cubic yards of mud, sand, clay, and gravel at $2.50	$80,000	
4,000 cubic yards of boulders and ledge at $25.00	100,000	
TOTAL COST OF BASIN		$180,000

(2) Construction of Breakwater

5,500 tons of stone at $10.00	55,000	
TOTAL COST OF BREAKWATER		55,000

b. AIDS TO NAVIGATION

Installing 1 daybeacon on the breakwater, 1 lighted bellbuoy and reflectors on 2 existing beacons	8,400	
TOTAL COST OF AIDS OF NAVIGATION		8,400
c. TOTAL PROJECT COST		$243,400

ESTIMATES OF ANNUAL CHARGES

32. The estimated annual charges have been computed on an assumed life of 50 years for the improvements. The annual charges have been separated into two divisions, those pertinent to the breakwater and those pertinent to the basin extension. Interest rates of 3 percent on the Federal investment and 3.5 percent on the non-Federal investment have been used throughout.

INVESTMENT

FEDERAL INVESTMENT

Breakwater Construction, Corps of Engineers	$ 55,000
Extending Basin, Corps of Engineers	153,000
Aids to Navigation, Coast Guard	8,400

TOTAL FEDERAL INVESTMENT.....$216,400

NON-FEDERAL INVESTMENT

Breakwater Construction, Local Interests	$ -
Extending Basin, Local Interests	27,000

TOTAL NON-FEDERAL INVESTMENT.....$ 27,000

ESTIMATED ANNUAL CHARGES

FEDERAL ANNUAL CARRYING CHARGES

Corps of Engineers	Breakwater	Basin	Total
Interest on Investment	$ 1,650	$ 4,590	$ 6,240
Amortization of Investment	490	1,360	1,850
Maintenance	500	1,500	2,000
TOTAL	$ 2,640	$ 7,450	$10,090

Coast Guard	Breakwater	Basin	Total
Interest on Investment	$ 255	$ -	$ 255
Amortization of Investment	75	-	75
Maintenance	700	-	700
TOTAL	$ 1,030	$ -	$ 1,030

TOTAL FEDERAL ANNUAL CARRYING CHARGES.....$ 11,120

NON-FEDERAL ANNUAL CARRYING CHARGES

	Breakwater	Basin	Total
Interest on Investment	$ -	$ 945	$ 945
Amortization of Investment	-	205	205
Maintenance	-	-	-
TOTAL	$ -	$ 1,150	$ 1,150

TOTAL NON-FEDERAL CARRYING CHARGES.....$ 1,150

TOTAL ANNUAL CARRYING CHARGES

	Breakwater	Basin	Total
Interest & Amortization	$ 2,470	$ 7,100	$ 9,570
Maintenance	1,200	1,500	2,700
TOTAL	$ 3,670	$ 8,600	$12,270

ESTIMATE OF BENEFITS

33. The plan of improvement was designed to provide protection from storm waves approaching the entrance from northeasterly and easterly directions, and to provide additional anchorage in the basin. The benefits to be derived from the considered improvements would accrue from reduction of storm damage to fishing boats, and from increases in fishing and recreational boating activities. The benefits have been classified into two categories; namely, those which are attributable to the construction of a breakwater at the entrance, and those which are attributable to the extension of the anchorage area in Flat Pond.

34. Local interests have advised that a total of $7,000 has been expended on repairs to the bulkhead over the most recent 10-year period. They believe that these repairs were necessary as a result of storm damage caused by the 2-to 4-foot storm waves which are stated to travel up the harbor perpendicular to the bulkhead. Field investigation of 1950 revealed that the bulkhead is of untreated pile and timber construction and that the total amount of $7,000 claimed for storm damages included all repairs to the bulkhead over the 10 year period. It is considered that wave attack, perpendicular to the bulkhead, would cause only minor damage to the bulkhead. Maintenance of an untreated shore structure such as this would normally be relatively high. An estimate of such maintenance was made and found to rate very closely with the amount of repairs made over the 10 year period. Hence no benefits were evaluated for storm wave attack on the bulkhead.

35. Local interests have reported an annual average storm damage of $1,200 to fishing boats moored in the basin. There was no estimate of damage to recreational craft. However, it is not believed to be very large, since this type of craft is usually in winter storage during the periods when storms are most apt to occur. The annual average damage to fishing boats is predicated on damage averaging about $200 a boat for 6 boats a year. This damage, it is stated, is caused by the 2-to

4-foot surge which, in coming up the harbor, overturns some boats at their moorings and sets others adrift, washing them ashore. No actual records of such damage have been kept. However, local interests believe that their estimate is conservative. In support of this they cited the most recent storm of November 1950, in which 1 boat incurred damage amounting to $3,200, and 4 other boats incurred damages of $200 each or a total of $4,000 for one storm. As this storm was of greater severity than ordinary storms, being of near hurricane proportions, it is not believed to be indicative of average storm damage. However, it appears to substantiate the claimed average damage of $1,200 annually. Therefore a general benefit of $1,200 is attributed to construction of the breakwater to eliminate such damage.

36. Local fishermen state that the turbulent conditions prevailing at the entrance after northeasterly and easterly storms prevent their leaving the harbor for 2 to 3 days after these storms. They state that this condition causes a loss to them averaging from 15 to 30 days per year. Long term storm records are not available for Ogunquit itself but records of gales are available for Boston, Massachusetts. Such records may be considered indicative of the occurrence of storms which would pass over Ogunquit and cause turbulence at the entrance. These records show that the annual average number of gales amounts to 18 per year of which 57 percent may be expected to originate in the north and northeast. On this basis 10 storms a year may be expected to cause turbulence for 2 to 3 days at the entrance after their occurrence. This could cause a loss of 20 to 30 days per year for the fishermen. It is, therefore, considered the loss of 15 days, claimed by the fishermen, may be accepted as the average annual loss that could be prevented by protection of the river entrance. It has been found also that of these 10 storms causing turbulence at the entrance, 3 may be expected to occur during the period from April through November.

These storms usually occur in November. It is therefore considered that the average annual lost time of fishermen during this period amounts to 5 days.

37. At the present time there are in the harbor 6 lobstermen who fish throughout the entire year and 9 lobstermen who fish during the period from April through November. On the basis of lost time previously described for this harbor, 6 of these lobstermen would lose 15 days each for a total of 90 days, and 9 would lose 5 days each for a total of 45 days. Thus the total average annual lost time of lobstermen amounts to 90 plus 45 or a total of 135 days. It has been determined that the daily catch of lobsters in this harbor will average 100 pounds per day. The net value of lobsters to the fishermen has been determined to be 22 cents per pound in this locality. Therefore the benefit to be realized by the elimination of turbulence at the entrance will be 135x100x$0.22, or $2,970. This is considered to be a general benefit applicable to the breakwater.

38. There are also 7 ground fishermen who base in Ogunquit and who fish throughout the entire year. These boats would, in the same manner as the lobstermen, lose 15 days per year due to turbulent conditions at the entrance to the harbor. Local interests have advised that the average daily catch for these boats amounts to about 500 pounds. The net value, or the price to the fishermen after deductions are made for the expense incurred in catching the fish, has been determined as $.03 per pound. This value compares favorably with similar harbors in the regional area. The net value of the increased catch of fish for these 15 days, which are now lost, would therefore, be 500x7x15x$.03 or $1,575. This is considered to be a general benefit applicable to the breakwater.

39. It was claimed by local interests that from 6 to 15 fishing boats would transfer from other harbors to base in Perkins Cove if the breakwater were constructed. These boats would be of the seiner type

which draw 5 to 6 feet of water. The reasons given by the fishermen for the transfer were; the nearness of the fishing grounds, which are located 1 to 10 miles offshore, and their inability to now base inside due to the limited depth of water. The estimate of 15 transfers is considered high, since only one fisherman specifically stated that he would transfer. He further stated that he knew of only 2 or 3 others that would transfer. A more reasonable estimate is that 6 boats would transfer from other nearby hearbors, such as Cape Neddick or York Harbor. Of the boats that would transfer 2 are locally owned. It is considered that the local owners would transfer for reasons of personal convenience and the non-local owners would transfer only for temporary periods of favorable fishing. Since these transfers would not result in an increase to the total national catch, no benefits have been evaluated from this source.

40. It has been estimated locally that 5 new boats would be added to the local fishing fleet in the event of the basin being extended. This estimate is considered optimistic. It has been found that a more reasonable estimate would be 3 new boats. Of these three new boats 2 would be lobster boats and 1 a seiner. It is also considered that these boats would be part time boats; fishing from April through November. In a season of this length it is reasonable to anticipate an average of 100 days fishing. At an average catch of 100 pounds per day for lobsters this would amount to an annual catch of 10,000 pounds or 20,000 pounds for the two new lobsterboats. As previously mentioned, the net value per pound of lobsters in this vicinity is 22 cents. Therefore, the total net value of the increased catch will be $0.22x 20,000 or $4,400. The average catch for seiners in this locality amounts to 500 pounds per day. In the part time season the annual catch would amount to 50,000 pounds. The net value of the ground fish in this locality has been determined to be 3 cents per pound. Therefore, the total net value of the increased catch will be

$.03x50,000 or $1,500. The total benefits to be obtained from additions to the fishing fleet would be $4,400 plus $1,500 or $5,900, attributable to the basin extension and a general benefit.

41. The existing recreational fleet, valued at $44,400 consists principally of inboard motor and auxiliary sail boats. The present replacement values of comparative boats vary from $1,200 to $10,000 for inboard motor boats and $3,200 to $9,000 for auxiliary sail. Included in this recreational fleet are 3 full time party, or sport fishermen, of which 2 are auxiliary sail boats and one is an inboard motor boat. The following list classifies these boats by type and valuations, based on the individual boats considered.

		PRESENT VALUE	
Craft-Length Ft.	No.	New	Depreciated (Average)
Inboards 18-45	13	57,200	28,600
Auxiliary Sailboats 25-40	5	31,600	15,800
TOTAL	18	88,800	44,400

Comparison of rental charges with maintenance costs for recreational craft in this vicinity indicates that if the recreational boats which are privately operated were operated on a for-hire basis the following net return could reasonably be anticipated on the average depreciated value of the existing recreational fleet.

Craft	Net Return
Inboards	2,860
Auxiliary Sailboats	1,420
TOTAL	$4,280

Thus the total benefits which can accrue to the existing fleet is $4,280. The fleet presently realizes all of these benefits. Loss of time due to turbulence at the entrance will affect these craft very little. Of the 10 storms per year, mentioned in Paragraph 36, which can be anticipated during the year, only one can be expected during

the period June through September. It is considered that recreational craft usually cruise during periods of very moderate seas and gentle swells and would not avail themselves of the opportunity for cruising during periods of heavy swells and therefore would not benefit from construction of the breakwater.

42. Local interests stated that during the summer vacation season the present anchorage in Flat Pond is usually filled to capacity. For this reason several summer residents have deferred the procurement of boats until more anchorage is available. If the basin is extended and more anchorage is provided the local harbor committee has estimated that five new boats will be added to the local recreational fleet. It is considered that these boats will be of a similar type as the existing fleet and will be composed of the following boats.

Craft	Length Ft.	No.	PRESENT VALUE	
			New	Depreciated (Average)
Inboards	41	4	20,000	10,000
Auxiliary Sailboats	32	1	7,200	3,600
TOTAL		5	27,200	13,600

These boats will realize the total possible benefit by extension of the basin. The net return to be realized on these boats, if they were operated on for-hire basis is:

Craft	Net Return
Inboards	1,000
Auxiliary	360
TOTAL	$1,360

The benefit, evaluated as the possible net return is $1,360 applicable to the basin extension. Of this benefit of $1,360, the general benefit is considered to be $680 and the local benefit $680.

43. No estimate is given as to the number of boats that would transfer if improvements are made. Local interest claimed that there would be a large number of such transfers but were unable to give any

specific number. It is considered that such transfers would be a matter of personal convenience to the owners. No benefits were evaluated from this source.

44. Transient boats now average 100 boats per season for a stay of about 2 days per boat. Local interests have estimated that this number will be doubled if more anchorage is provided in the harbor. They base this estimate on the number of craft that were unable to secure mooring there and had to be turned away in 1950. Since this estimate is based on actual count, it is considered reasonable to accept it as indicative of the transient boating in the area. On this basis the increase in transient boating will amount to 200 boat days or somewhat more than the equivalent of 2 additional boats added to the home fleet. It is considered that these boats will be of the auxiliary sail type. The benefits to be realized by these vessels is equal to the possible net return to be derived by the addition to the local fleet of 2 auxiliary sail boats of the class presently using the harbor.

			PRESENT VALUE		
Craft	Length in Ft.	No.	New	Depreciated (Average)	Net Return
Auxiliary Sailboats	35	2	16,000	8,000	$720

The benefit from additional transient craft is thus $720 attributable to the basin extension, considered to be equally local and general in nature.

45. The total evaluated benefits are tabulated as follows:

BENEFITS ATTRIBUTABLE TO BREAKWATER CONSTRUCTION

Source	TYPE General	TYPE Local	Total
Storm damage-Fishing boats	1,200	-	1,200
Lost time, Fishing boats	4,545	-	4,545
TOTAL	$5,745	-	$5,745

BENEFITS ATTRIBUTABLE TO BASIN EXTENSION

Source	TYPE General	TYPE Local	Total
Additions to Recreational Fleet	680	680	1,360
Additions to Fishing Fleet	5,900	-	5,900
Additional Transient Recreational Fleet	360	360	720
TOTAL	$6,940	$1,040	$7,980

COMPARISON OF BENEFITS TO COSTS

46. The ratios of benefits to costs for the basin and breakwater are as follows:

Breakwater

Annual Benefits	$5,745
Annual Costs	3,670
Ratio of Benefits to Costs	1.6 to 1

Basin Extension

Annual Benefits	$7,980
Annual Costs	8,600
Ratio of Benefits to Costs	0.9 to 1

ALLOCATION OF COSTS

47. Local interests should bear a portion of the cost of the improvement commensurate with the local benefits to be derived from the improvement. The allocation of costs between the United States and local interests is therefore made on the basis of relative benefits applied to the annual carrying charges, exclusive of aids to navigation which are considered to be a Federal responsibility. The allocation of costs would be as follows:

EVALUATED BENEFITS

	Breakwater	Percent Total	Basin	Approximate Percent Total
General	5,745	100	6,940	87
Local	-	-	1,040	13
Total	5,745	100	7,980	100

ANNUAL CHARGES

General	2,640	100	7,450	87
Local	-	-	1,150	13
Total	2,640	100	8,600	100

48. The above allocation indicates that the entire cost of the breakwater would be borne by the Federal Government. The costs of extending the basin if authorized would be proportioned between the Federal Government and local interests. On the basis of a 50-year life for the project, at interest rates of 3 percent on Federal investments and 3.5 percent on non-Federal investments, the allocation to local interests of the annual charge of $1,150 for the basin would represent the necessity of an initial investment by local interests of $27,000 or 15 percent of the total project cost.

PROPOSED LOCAL COOPERATION

49. The evaluated benefits to be derived from the proposed improvements, if undertaken, pertain to the provision of a protected channel at the entrance to the harbor, the prevention of storm damage to boats in the basin, and the extension of mooring area in the anchorage basin. Protection of the entrance channel is expected to result in an increase of available fishing time, which will further result in an increased catch of fish. Prevention of damage to fishing boats in the basin will result in decreased operational costs for the local fishing fleet, thus increasing the net value of the fish. The benefits applicable to the breakwater are general in character. Therefore, no local cash contribution should be required for construction of the breakwater. If the basin is extended, a determination of the relation

between the general and local benefits reveals that local interests should contribute 15 percent or $27,000 toward the initial construction costs. In the event either improvement is undertaken separately, local interests should be required to furnish all lands, easements, and rights of way, including spoil areas, necessary for the accomplishment and maintenance of the improvement, and to hold and save the United States free from claims for damages due to the construction works.

COORDINATION WITH OTHER AGENCIES

50. All Federal, State, and local agencies having interest in the development and use of waterways were notified of the public hearing held at Ogunquit, Maine, August 28, 1950, on the proposed improvement. All agencies that expressed interest in the harbor were in favor of the desired improvement. Subsequent to the plan of improvement proposed herein, local interests have been consulted on the proposed plan of improvement and have expressed general agreement with the plan.

DISCUSSION

51. The Josias River is a small, partly tidal river, which empties into Perkins Cove about 30 miles southwest of Portland, Maine. About 50 years ago local interests changed the course of the river to flow into Perkins Cove instead of Oarweed Cove into which it then flowed. This was done to enable fishermen, who then based in Perkins Cove, to seek refuge more readily in the river from northeasterly and easterly storms. In 1941 local interests deepened the channel and dredged an anchorage in a wide part of the river, about 800 feet from the entrance.

52. The existing Corps of Engineers project was authorized by the River and Harbor Act of 1945. It provides for a channel 5-foot deep in the river and an anchorage of the same depth and about 3 acres in area about 800 feet upriver from the entrance. Work is presently in progress on this project with completion scheduled for the latter part of June 1951.

53. The river and anchorage is used extensively by recreational craft, both local and transient, in the summer vacation season, and by the local fishing fleet throughout the entire year. The combination of these fleets presently fills the harbor to its full capacity. Local interests report that during the summer vacation season, numerous transient boats have requested moorings and have been denied them due to lack of room in the anchorage.

54. In order to correct this condition local interests, requested extension of the anchorage from 200 to 400 feet in a westerly direction. They estimated the addition of 5 new boats to the local recreational fleet, 5 new boats to the local fishing fleet and 100 more transient recreational craft in the event of improvement. The estimate of recreational craft was considered reasonable since local interests could give specific data concerning them. However, the estimate of new fishing boats was considered optimistic since only data concerning 3 new boats could be given.

55. The considered plan of improvement, which was in accordance with the requested plan, would provide amply for the claimed additions to boating activities. However it was found that certain factors, including the nature of the material which would be encountered in this area and high mobilization costs to transport dredging equipment to this locality, would entail a relatively high unit dredging cost. The total costs of dredging this area is estimated at $180,000 of which $27,000 would be required as a cash contribution from local interests. The total annual carrying charges were computed at $8,600 and the annual benefits at $7,980 resulting in a benefit-cost ratio of 0.9 to 1. In view of this, extension of the anchorage basin is not economically justified.

56. The entrance into Josias River, at the head of Perkins Cove is unprotected from storms originating in northeasterly and easterly directions. Navigation of the entrance is impossible during these

storms and for periods from 2 to 3 days subsequent thereto due to the heavy swells which prevail after such storms. These heavy swells break over the ledges on the north side of the cove creating a turbulence and surge which continues up the river and damages boats. This condition also prevents ingress to or egress from the river until the swells have abated. As a result of the condition at the river entrance, fishermen lose an average of 15 days annually.

57. The design and general location of the breakwater meets the desires of local interests. It will provide protection against heavy swells at the entrance, thus enabling the local fishing fleet to gain additional days of fishing, which are now lost due to the condition at the entrance. This will result in an increased catch of fish to be added to the nation's food supply. It will also eliminate the damage caused by the surge which prevails in the river at times of heavy swells outside the entrance. The cost of construction of the breakwater is estimated at $55,000. The annual carrying charges would be $3,670. The annual benefits would be $5,745. Comparison of the annual benefits to annual costs results in a benefit-cost ratio of 1.6 to 1.0 which indicates that the construction of the breakwater is economically justified. Since the breakwater will provide benefits which are entirely general in character it is believed that the entire cost of construction should be borne by the United States.

CONCLUSIONS

58. The Division Engineer concludes that modification of the existing project for Josias River to provide protection of the entrance against heavy seas and swells by means of a breakwater is warranted. He further concludes that modification of the existing project by extending the present anchorage basin is not economically justified at this time.

59. The improvement on the north side of Perkins Cove consisting of a breakwater 350 feet long, having a top width of 10 feet at an

elevation of 15 feet above mean low water can be completed at an estimated cost of $55,000 for new work plus $8,400 for aids to navigation. The ratio of 1.6 to 1 for evaluated annual benefits to annual costs indicates the project is economically justified.

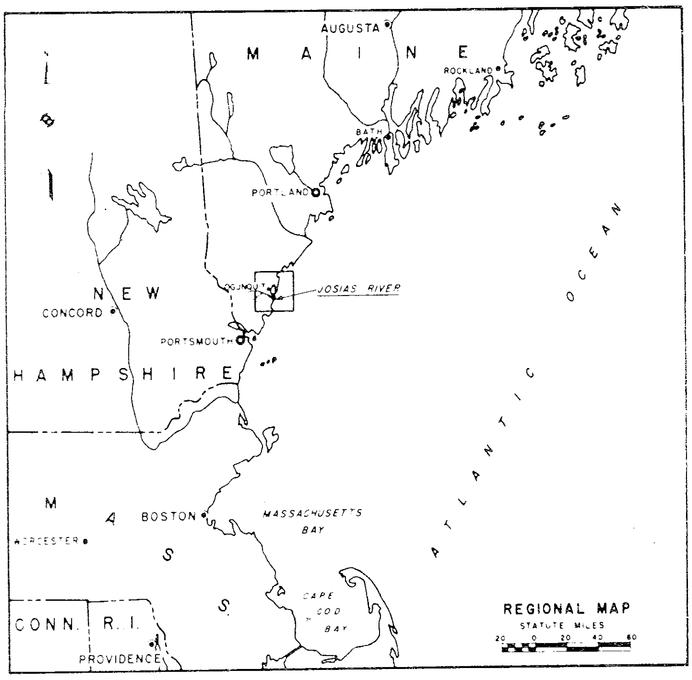
60. The nature of the benefits, which pertain to general navigation and to basic sources of food supply, warrants the construction of the breakwater at the expense of the United States. If the project is authorized, funds for the improvement should be appropriated in one fiscal year to secure economical prosecution of the project.

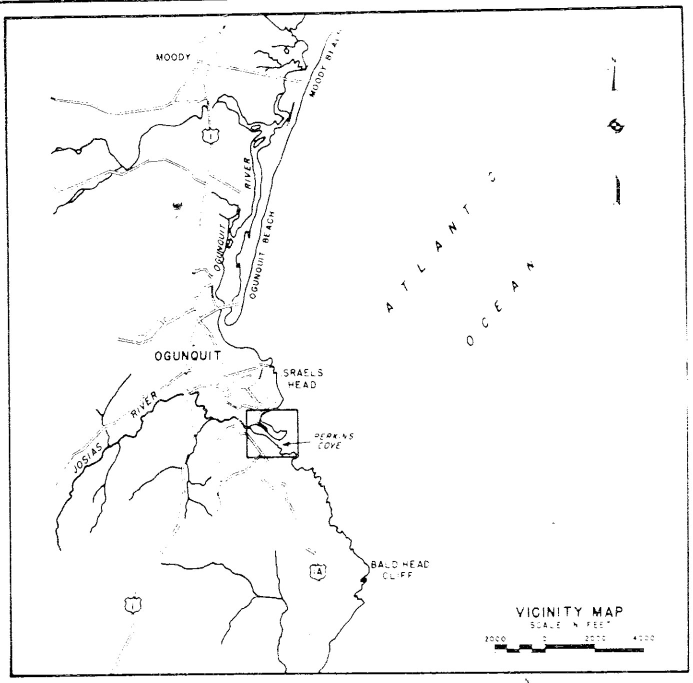
RECOMMENDATION

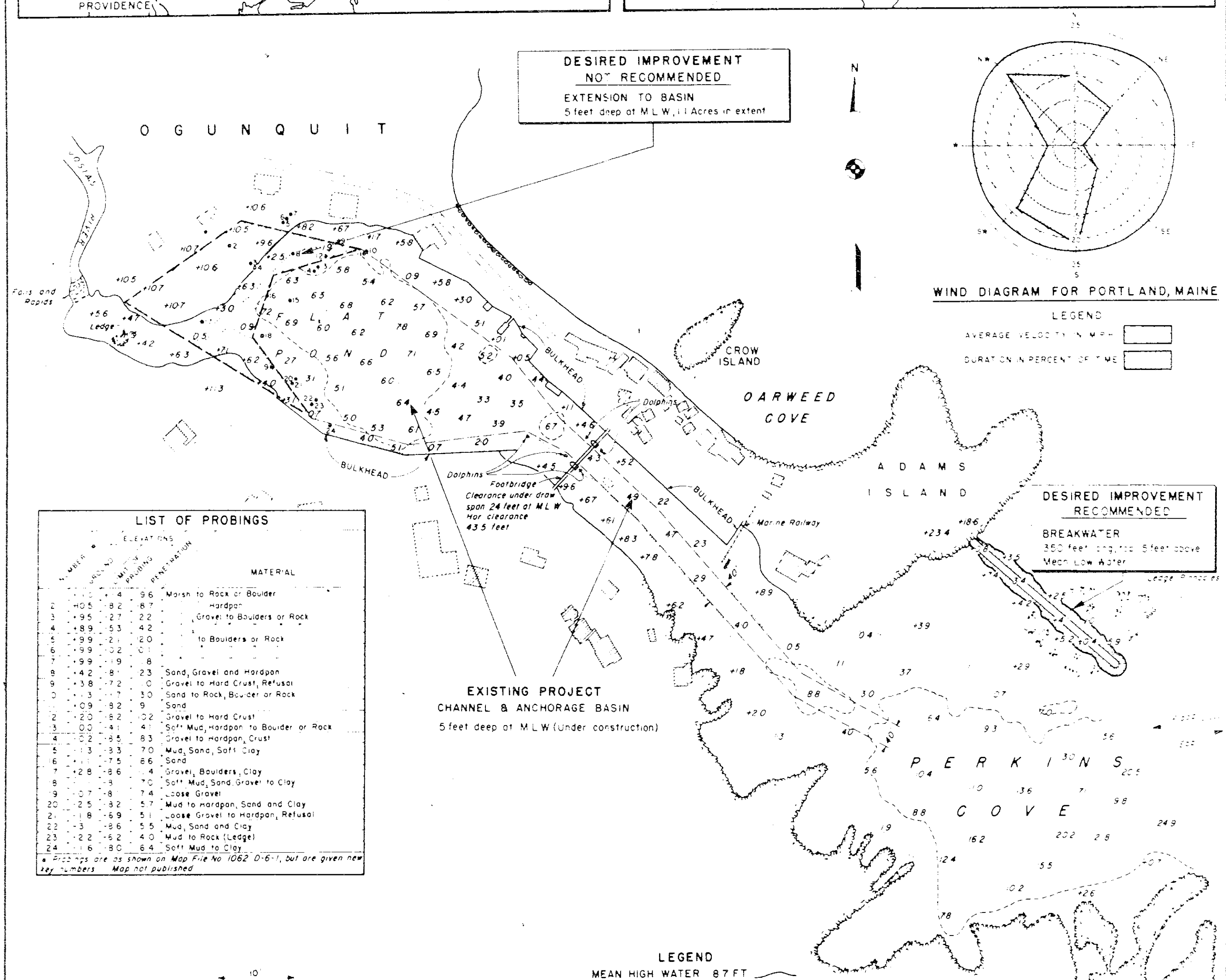
61. It is recommended that the United States modify the existing project for Josias River to include; a breakwater extending 350 feet in a southeasterly direction from the southeast side of Adams Island to the ledge pinnacles on the north side of Perkins Cove. The breakwater is designed for a top width of 10 feet at an elevation of 15 feet above mean low water, with side slopes of 1 on 1.5, all as generally shown on Plate 1. The construction is estimated to cost $55,000 with $500 annually for maintenance, exclusive of costs of aids to navigation. The project modification is recommended subject to the condition that local interests provide without cost to the United States all lands, easements and rights-of-way necessary for the construction and for its subsequent maintenance. In addition, they should agree to hold and save the United States free from damages due to the construction works. It is further recommended that no alteration to the anchorage basin be made at this time.

H. J. WOODBURY
Colonel, Corps of Engineers
Division Engineer

1 Inclosure:
Plate 1



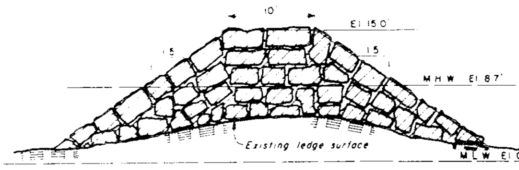




LIST OF PROBINGS

Number*	Elevations: Ground	Elevations: Limit of Probing	Penetration	Material
[illegible]	[illegible]	+1.4	9.6	Marsh to Rock or Boulder
2	+10.5	-8.2	18.7	Hardpan
3	+9.5	-2.7	12.2	Gravel to Boulders or Rock
4	+8.9	-5.3	14.2	"
5	+9.9	-2.1	12.0	to Boulders or Rock
6	+9.9	-0.2	10.1	"
7	+9.9	-1.9	11.8	"
8	+4.2	-8.1	12.3	Sand, Gravel and Hardpan
9	+3.8	-7.2	11.0	Gravel to Hard Crust, Refusal
10	+1.3	-1.7	3.0	Sand to Rock, Boulder or Rock
11	+0.9	-8.2	9.1	Sand
12	+2.0	-8.2	10.2	Gravel to Hard Crust
13	0.0	-4.1	4.1	Soft Mud, Hardpan to Boulder or Rock
14	-0.2	-8.5	8.3	Gravel to Hardpan, Crust
15	-1.3	-3.3	7.0	Mud, Sand, Soft Clay
16	+1.1	-7.5	8.6	Sand
17	+2.8	-8.6	11.4	Gravel, Boulders, Clay
18	[illegible]	-8	7.0	Soft Mud, Sand, Gravel to Clay
19	-0.7	-8	7.4	Loose Gravel
20	-2.5	-8.2	5.7	Mud to Hardpan, Sand and Clay
21	-1.8	-6.9	5.1	Loose Gravel to Hardpan, Refusal
22	-3	-8.6	5.5	Mud, Sand and Clay
23	-2.2	-6.2	4.0	Mud to Rock (Ledge)
24	-1.6	-8.0	6.4	Soft Mud to Clay

* Probings are as shown on Map File No 1062 D-6-1, but are given new key numbers. Map not published.



TYPICAL SECTION OF BREAKWATER

SCALE IN FEET

LEGEND

MEAN HIGH WATER 8.7 FT
MEAN LOW WATER
5-FT CURVE OF DEPTH
PROBING LOCATIONS
LEDGE ABOVE M.H.W.

NOTES:

Soundings and probings are in feet and tenths and are referred to the plane of Mean Low Water.

Hydrography from survey of Nov 21 to 23, 1949, by K. B. Cole, Mar 13 & 14, 1951, by N. A. Briggs and Perkins Cove Area 1946.

Topography and Probings from survey of Dec 1945 and Jan 1946.

JOSIAS RIVER, MAINE

IN 1 SHEET — SCALE IN FEET

NEW ENGLAND DIVISION, BOSTON, MASS. MAY 16, 1951

APPROVED: John E. Allen, CHIEF, ENGINEERING DIVISION

APPROVED: [signature], COL. C.E., DIVISION ENGINEER

SUBMITTED: [signature], CHIEF, PLANNING AND REPORTS BRANCH

Francis K. Fogarty, CHIEF, RIVER & HARBOR SECT. — DR. BY MCN, TR. BY MCN, CK. BY

TO ACCOMPANY SURVEY REPORT DATED JUNE 8, 1951

FILE NO. 1192-D-6-1